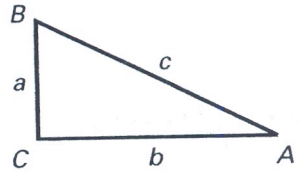
9.3 The Converse of the Pythagorean Theorem

Goals
- Use the Converse of the Pythagorean Theorem to solve problems.
- Use side lengths to classify triangles by their angle measures.

THEOREM 9.5: CONVERSE OF THE PYTHAGOREAN THEOREM

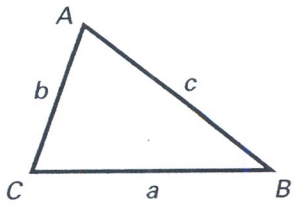
If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a _____ triangle.



If $c^2 = a^2 + b^2$, then $\triangle ABC$ is a _____ triangle.

THEOREM 9.6

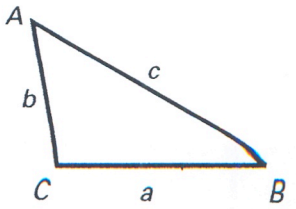
If the square of the length of the longest side of a triangle is less than the sum of the squares of the lengths of the other two sides, then the triangle is _____.



If $c^2 < a^2 + b^2$, then $\triangle ABC$ is _____.

THEOREM 9.7

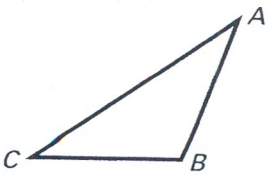
If the square of the length of the longest side of a triangle is greater than the sum of the squares of the lengths of the other two sides, then the triangle is _____.



If $c^2 > a^2 + b^2$, then $\triangle ABC$ is _____.

THEOREM 5.13: TRIANGLE INEQUALITY

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.



_____ + _____ > AC

AC + _____ > _____

_____ + AC > _____

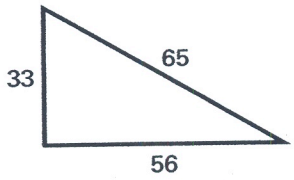
Checkpoint Decide if it is possible to construct a triangle having the given side lengths. If it is not possible, explain.

3. 13 mm, 25 mm, 14 mm

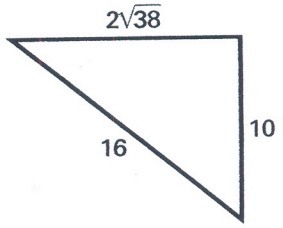
4. 9 in., 17 in., 8 in.

Checkpoint Tell whether the triangle is a right triangle.

1.



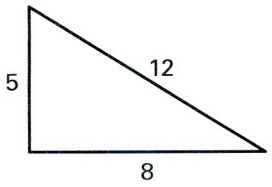
2.

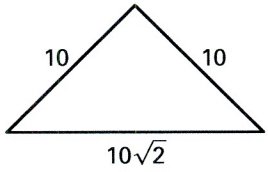


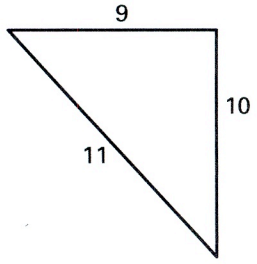
Decide whether the numbers can represent the side lengths of a triangle.

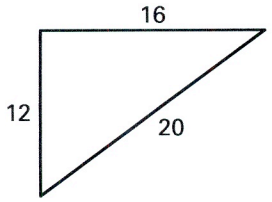
1. 5, 4, 3
2. 5, 6, 7
3. 5, 5, 10
4. 5, 10, 10
5. 5, 10, 15
6. 5, 15, 15

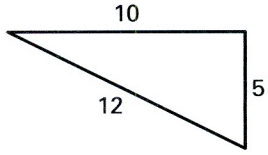
Tell whether the triangle is a right triangle.

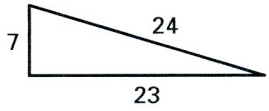
7. 

8. 

9. 

10. 

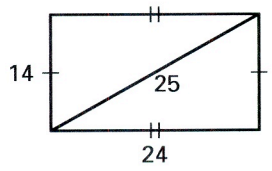
11. 

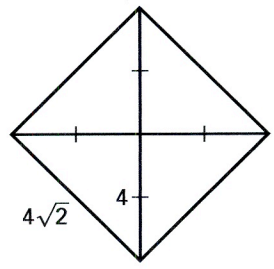
12. 

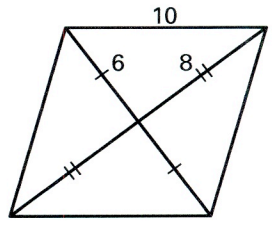
Classify the triangles with the given side lengths as *right, acute,* or *obtuse*.

13. 6, 8, 10
14. 6, 6, 10
15. 6, 10, 10
16. $\sqrt{6}$, $\sqrt{8}$, $\sqrt{10}$
17. 0.6, 0.8, 1.0
18. 7, 9, 11

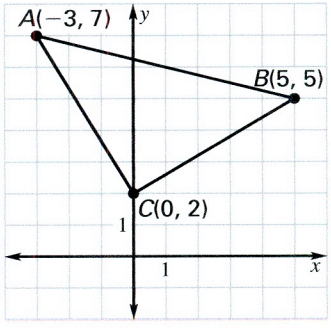
Classify the quadrilateral. Explain how you can prove that the quadrilateral is that type.

19. 

20. 

21. 

In Exercises 22–24, you will use two different methods for determining whether $\triangle ABC$ is a right triangle.



22. ***Method 1*** Find the slope of $\overline{AC}$ and the slope of $\overline{BC}$. What do the slopes tell you about $\angle ACB$? Is $\triangle ABC$ a right triangle? How do you know?
23. ***Method 2*** Use the Distance Formula and the Converse of the Pythagorean Theorem to determine whether $\triangle ABC$ is a right triangle.
24. Which method would you use to determine whether a given triangle is right, acute, or obtuse? Explain.

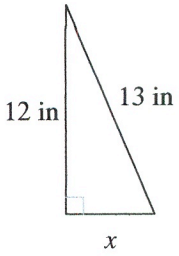
 Name_____

The Pythagorean Theorem and Its Converse

Date_____ Period____

Find the missing side of each triangle. Round your answers to the nearest tenth if necessary.

1)



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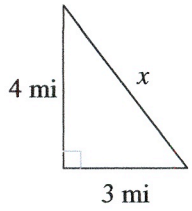

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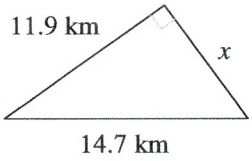
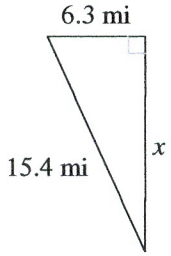
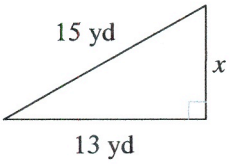


4)



Find the missing side of each triangle. Leave your answers in simplest radical form.

5)



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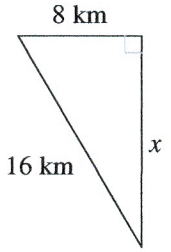
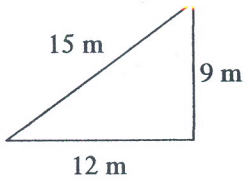
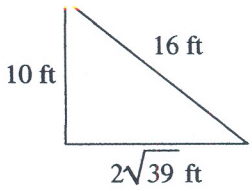


Find the missing side of each right triangle. Side *c* is the hypotenuse. Sides *a* and *b* are the legs. Leave your answers in simplest radical form.

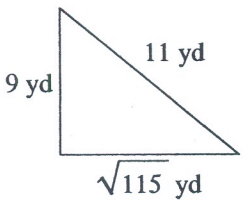
7) $a = 11$ m, $c = 15$ m

8) $b = \sqrt{6}$ yd, $c = 4$ yd





11)



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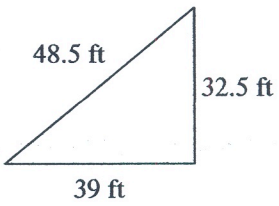


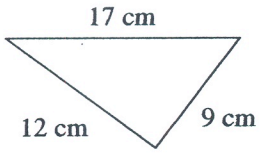
State if the three sides lengths form a right triangle.

13) 10 cm, 49.5 cm, 50.5 cm

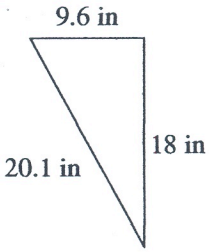
14) 9 in, 12 in, 15 in

State if each triangle is acute, obtuse, or right.

15)



16)



State if the three side lengths form an acute, obtuse, or right triangle.

17) 6 mi, $2\sqrt{55}$ mi, 17 mi

18) 4.8 km, 28.6 km, 29 km

Example 2 *Classifying Triangles*

Decide whether the set of numbers can represent the side lengths of a triangle. If they can, classify the triangle as *right*, *acute*, or *obtuse*.

a. 28, 40, 48 **b.** 5.7, 12.2, 13.9

Solution

Compare the square of the length of the longest side with the sum of the squares of the lengths of the two shorter sides.

a. $c^2 \_?\_ a^2 + b^2$ **Compare c^2 with $a^2 + b^2$.**

$\_\_^2 \_?\_ 28^2 + \_\_^2$ **Substitute.**

$\_\_\_\_ \_?\_ \_\_\_\_ + \_\_\_\_$ **Multiply.**

$\_\_\_\_ \_\_ \_\_\_\_$ **c^2 is ____ than $a^2 + b^2$.**

Answer Because $c^2 \_\_ a^2 + b^2$, the triangle is _____.

b. $c^2 \_?\_ a^2 + b^2$ **Compare c^2 with $a^2 + b^2$.**

$\_\_\_\_^2 \_?\_ \_\_\_\_^2 + 12.2^2$ **Substitute.**

$\_\_\_\_ \_?\_ \_\_\_\_ + \_\_\_\_$ **Multiply.**

$\_\_\_\_ \_\_ \_\_\_\_$ **c^2 is ____ than $a^2 + b^2$.**

Answer Because $c^2 \_\_ a^2 + b^2$, the triangle is _____.

✔ ***Checkpoint*** **Can the numbers represent the side lengths of a triangle? If so, classify the triangle as *right*, *acute*, or *obtuse*.**

3. 16, 30, 34	**4.** 8, 13, 22	**5.** 6, 9, 12